

6.1 Molecular Biomimetics at ONR: Processes



Green Synthesis of Energetic Materials

EM Targets

Dimethyldinitrobutane (plastic explosives marker)

Hexanitrostilbene (ejection systems)

Butanetriol (BTTN precursor) from CO₂

Aromatics, including nitration (many applications) from CO₂

Metabolic Engineering for Degradation of Chemical Agent Simulants

Energy Harvesting

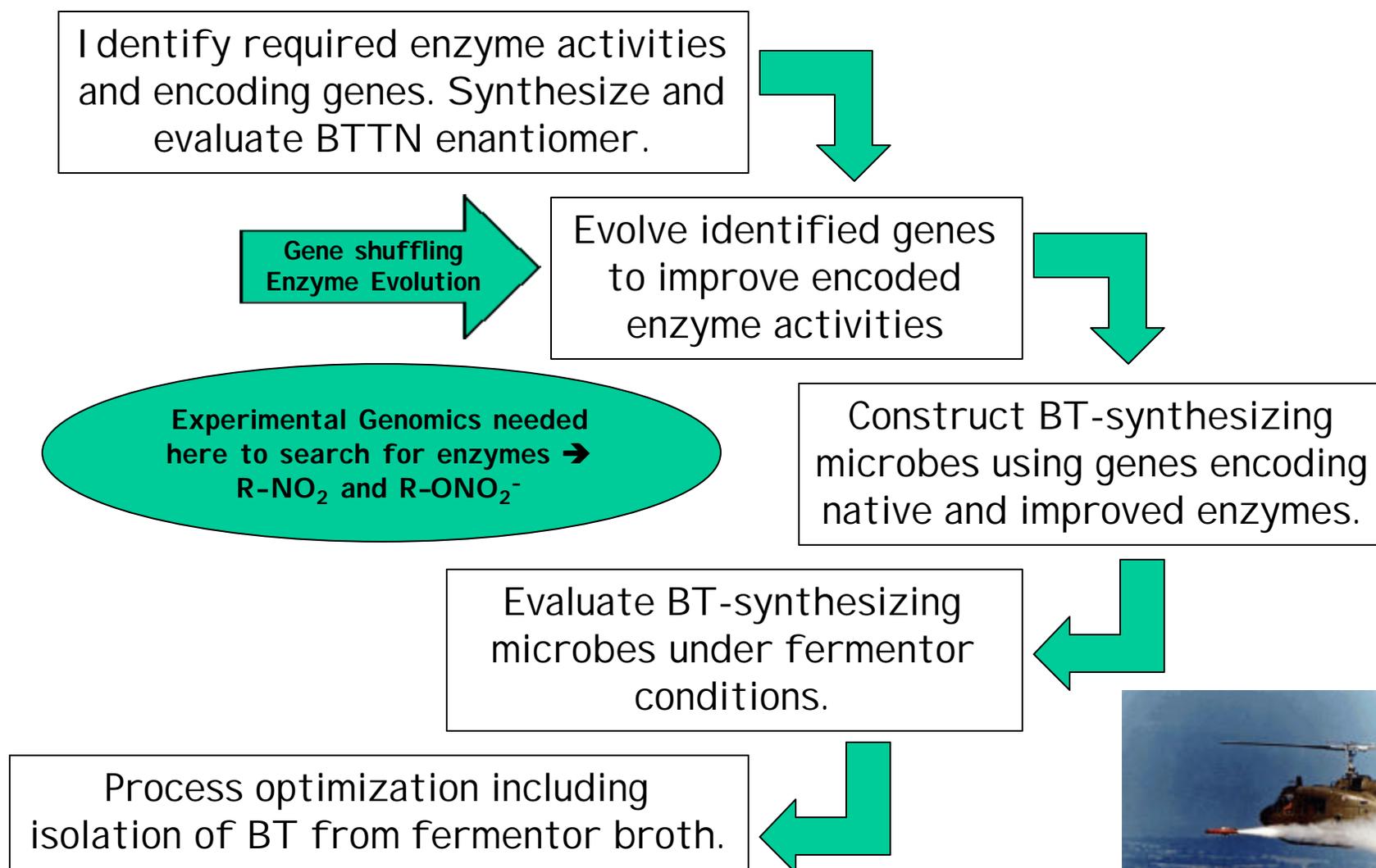
Benthic Fuel Cell (to power sensor networks on ocean floor)

New Biofuel Cells, Microbial and Molecular (fuel-flexible applications)

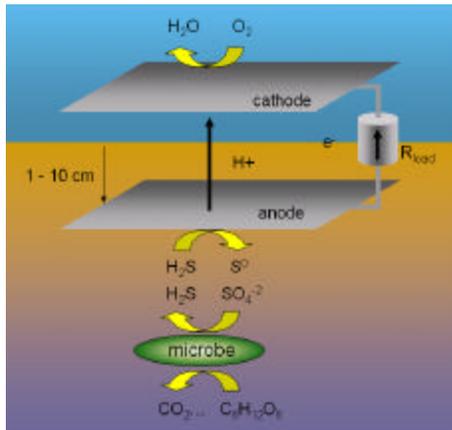
Implantable Glucose/O₂ Biofuel Cell (prosthetics)

Conformal Biomolecular Photovoltaic Device (uniforms, tents, etc.)

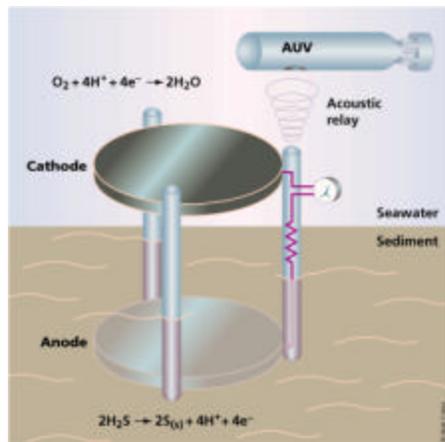
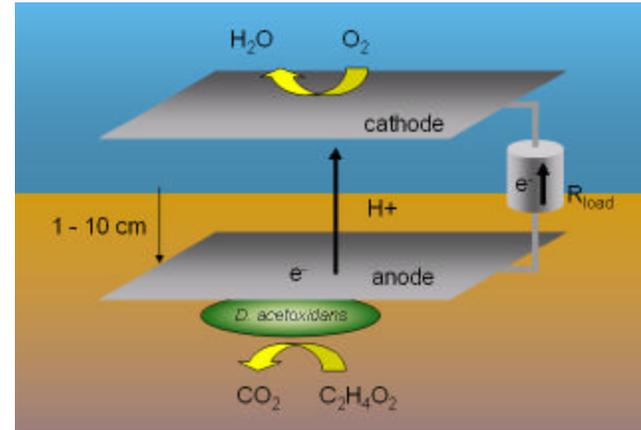
Processes: Green Synthesis of Energetic Compounds, Using Butanetriol as a Case Study



Processes: Benthic Fuel Cell at Ocean/Sediment Interface



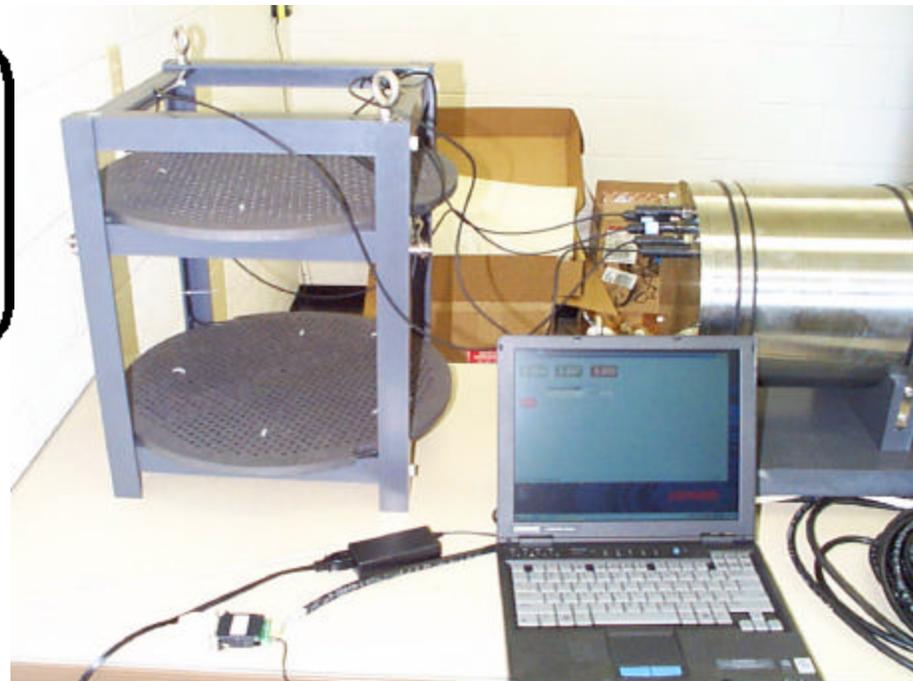
Anode reactions involve:
acetate oxidation →
← and (indirect) sulfide oxidation



Genomics
have been
used on
this
project

Objective: Harvest ~1 Watt continuous power @ ~0.7V

Accomplishment: Harvests ~0.3 W/m² continuous power @ ~0.7V



Molecular Biomimetics at ONR



Harold Bright, ONR 342

Program goal is to enable development of novel

materials - e.g. elastomers for robotics, propulsors; **isoprenoids**

processes - e.g. engineered metabolic pathways for green synthesis or **chemical agent degradation**, energy harvesting fuel cells



sensors - e.g. engineered molecular receptors and ion channels for analog/digital sensing

through advanced understanding and exploitation of design principles found in Nature and through recruitment of world-class scientists